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ABSTRACT

This document describes and comments on the extent of use of the Delphi method in higher education decision making. Delphi is characterized by: (1) anonymity of response; (2) multiple iterations; (3) convergence of the distribution of answers; and (4) statistical group response (median, interquartile range) preserving intact a distribution that may still remain wide. Since its first use in higher education at least five major new fields have emerged. These fields are: (1) cost-effectiveness, cost/benefits analysis; (2) curriculum and campus planning; (3) college, university-wide educational goals and objectives; (4) consensus on rating scales, values, and other evaluation elements; (5) generalized educational goals and objectives for the future. The document discusses the Delphi method in relation to each of these fields, criticism about the Delphi approach, and its cost in terms of time and money. The Delphi method is found to be beneficial to higher education planning. (Author/KE)

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Delphi Decision Methods in Higher Education Administration

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Like the proverbial iceberg, what can be seen of Delphi in higher education administration is about 10 per cent of the mass that exists. If you consult any of the better known bibliographies on the Delphi method, such as the Rand Corporation listing,[1] you find one entry on Delphi in education out of a total of 41 listings. Adelson's pioneering article in American Behavioral Scientist[2] lists nothing beyond Werner Hersch's book Inventing Education for the Future which had as its source the same datum as the Adelson article. This paper takes for its focus a description and commentary on the extent of Delphi use in higher education.

One of the immediate realizations about Delphi is that although developed under Air Force sponsorship at Rand, it has had a wide use in industry. There it has had its principal role in technological forecasting. Another major segment of human endeavor to undertake systematic use of the Delphi technique has been the medical field. The development of Delphi has not been limited to the United States. Articles and books on the subject have appeared in Great Britain, the Continent and even in Russia.[3]

The other urgent realization about Delphi is that it is not a singular nor unchanging approach to problem-solving about the future. Norman Dalkey, one of the principal originators of the method, speaking at the American Statistical Association national meeting at Fort Collins, Colorado this past August tells a story on himself. He relates that in speaking to a group of

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engineers he was interrupted by one of them who objected, "that doesn't sound anything like the paper you wrote six years ago." Dalkey made the point that in a rapidly changing field, "modification in procedures are called for."[4] In this same address he pointed out that, useful as Delphi may be in forecasting future developments, it is beginning to be seen as useful in the generation and assessment of goals and objectives.

For the few readers of this paper who have not become acquainted with the Delphi method, Delphi is characterized by:[5]

1. anonymity of response
2. multiple iterations
3. convergence of the distribution of answers
4. a statistical group response (median, inter-quartile range) preserving intact a distribution that may still remain wide.

The first apparent reference to Delphi or use of Delphi in the context of higher education was reported in the Adelson paper cited earlier, the Hersch book cited above, and in a paper by Olaf Helmer published by Rand in December 1966.[6]

Since then at least five major uses of the Delphi method have emerged in higher education. These five fields are:

1. Cost-Effectiveness, Cost/Benefit Analysis
2. Curriculum and campus planning
3. College, University-wide, and State-wide educational goals and objectives.
4. Consensus on rating scales, values and other evaluation elements.
5. Generalized educational goals and objectives for the future.

All the first efforts at using Delphi (Adelson, Hersch, Helmer) seem to have been directed at the last item, generalized educational goals and objectives for the future. Today it may be the least important use.

The least developed field in terms of Delphi utilization is the field of cost-effectiveness and cost/benefit analysis. The first public mention of such use apparently occurred in August 1969 when the writer presented a paper to a Fiscal Management Seminar sponsored by the U.S. Office of Education at Manchester, N.H.[7] and suggested that in making a cost/benefit analysis of a proposed change in a liberal arts college curriculum, the Delphi technique could be employed to get a better assessment of the "benefit" side of the proposed change. In that same year, Arnold Riesman published a technical memorandum on "Evaluation and Budgeting Model for a System of Social Agencies"[8] that employed a Delphi approach to budget determination. The most complete theoretic discussion of this use of Delphi appears in a Rand publication by E. S. Quade on Cost Effectiveness: Some Trends in Analysis.[9] Some sense of the importance of this approach may be communicated by this excerpt from Quade's work:[10]

> "In general, the value, V, that will be obtained from the application of a project, will typically appear as a function of its degree of adoption, q, in the form of an S-shaped curve, as in the figure.

"A Delphi procedure can then be used to obtain a consensus opinion of the panel regarding two points on this curve: the value q^L below which adoption of the project would be pointless, and the value q^H above which the marginal benefits are so small as to make adoption wasteful. (One would expect many estimates of q^H to be zero, indicating total rejection of the project.)"

There is much that can be done to utilize Delphi techniques in cost-effectiveness and cost-benefit analysis. The major deterent is the focus of a great many PPBS advocates on a format for cost capture, with little if any attention to the effectiveness or benefit side of the educational equation.

Curriculum and campus planning has represented an area for Delphi use to a greater extent than cost analysis. This area is difficult to pinpoint since there is a considerable reticence to revealing the use of Delphi in this realm. For example, although the earliest known Delphi use in curriculum planning took place more than two and a half years ago (February 1969), those pioneers still are reluctant to be identified. This particular use of Delphi has been warmly endorsed by Frederick Bolman in speaking to the Association of Governing Boards of Universities and Colleges in

October 1970.[11] The specific reference by Dr. Bolman was directed to an article of this author that appeared in College and University Business[12] and described, in part, the use of Delphi in curriculum and campus planning. An example of the kind of topics dealt with in that Delphi exercise is found in the table below:

Faculty Disagree	Consensus Rating	Rank	Item
_____	A	1	Seminars, small groups
_____	B	2	Learning center, variety of methods, carrels
_____	C	3	Counseling, individual contact
_____	C	4	Individually planned instruction
_____	C	5	Informal environment conducive to learning
_____	C	6	Audio-Visuals
_____	C	7	Field work, supervised experiences
_____	B	8	Computer assisted instruction
_____	B	9	Team teaching
_____	B	10	Laboratories for various disciplines
_____	B	11	Lectures, large group presentations
_____	A	12	Programmed learning
_____	B	13	Differential staffing, supportive help for teachers
_____	A	14	Cultural activities
_____	A	15	Frequent testing
_____	A	16	Decentralized libraries

This is the actual format from one section entitled, "Teaching Methodology" and represents a portion of the third round feedback to participating faculty of that college. The consensus rating is coded: A - very strong consensus, B - strong consensus, C - moderate consensus, D - little consensus. The space, "faculty disagreement" was for use by any recipient in expressing disagreement. The instructions called for "indicating disagreement as to any item and writing in the space provided below the listing, the reasons for disagreement, (i.e., whether the item should be ranked higher or lower, and why). At the conclusion of that Delphi exercise on curriculum planning, the change proposed by group consensus was successfully adopted by a vote of the full faculty of this pioneering college.

At the present time, a professional college of a major midwestern university is about to embark on a Delphi exercise seeking a consensus about changes needed in their curriculum. The writer has been privileged to be invited to advise and review this undertaking, but again, there is a prohibition against identifying the undertaking. Perhaps these schools are observing Dr. Bolman's advice to "change more and talk less about it."[13]

Probably the greater visibility of Delphi use for College, University-wide and State-wide educational goals and objectives planning is the consequence of at least two AERA forums where reports of this type of activity have been encouraged, as well as the fact that almost without exception these Delphi exercises have engaged the attention of those outside the immediate institution involved. Thus, the University of Virginia involved more than 400 respondents in their Delphi exercise. These represented 89 related to the faculty or student body of the School of Education. 58 other leadership

positions in the University of Virginia, 41 off campus educators in Virginia, 48 influential Virginia individuals who were not necessarily professional educators, 73 influential political individuals, 82 influential newspaper, business and labor individuals plus 30 teacher educators of national reputation.[14] They asked for five or six word answers to complete the following sentence, "by citing no fewer than one nor more than five targets."[15]

> "In the next decade, the School of Education of the University of Virginia should concentrate its energies and resources on:
>
> increasing_____
>
> solving_____
>
> developing_____
>
> Preparing_____
>
> (_____)_____"

This resulted in (almost 300) responses involving 750 answers which were condensed by the investigating group into 61 generic statements. The following excerpt from the second round questionnaire includes one bogus item, No. 44, that was intentionally inserted.

High					Low		
(	1	2	3	4	5	)	35. Preparing teachers and administrators at the graduate level without requiring prior experience.
(	1	2	3	4	5	)	36. Reconciling emerging conflicts in the teaching profession between an emphasis upon human values and an emphasis upon knowledge and technology.
(	1	2	3	4	5	)	37. Preparing plans which schools could use for goal definition.
(	1	2	3	4	5	)	38. Explore the possibility of twelve-month school term.

High Low

(1 2 3 4 5) 39. Increasing the qualitative status of the teacher in contemporary society.

(1 2 3 4 5) 40. Eliminating competition among institutions of higher learning in Virginia.

(1 2 3 4 5) 41. Preparing interdisciplinary courses for high school adoption.

(1 2 3 4 5) 42. Providing the kind of education needed to solve the problems of contemporary society, such as urban and communication problems.

(1 2 3 4 5) 43. Developing programs that will increase the capabilities of graduates of the School of Education to produce and utilize research.

(1 2 3 4 5) 44. Emphasizing the production of doctoral graduates who can improve the programs in Schools of Medicine, Law, Nursing, and Engineering.

(1 2 3 4 5) 45. Developing criteria, procedures, and tests for measuring without bias such factors as pre-school skills, teacher effectiveness, educational programs, and intellectual aptitude.

(1 2 3 4 5) 46. Increasing intellectual self-respect of the graduates of the School of Education.

(1 2 3 4 5) 47. Preparing teachers and administrators to utilize effectively modern technology such as educational television and computer assisted instruction.

(1 2 3 4 5) 48. Increasing professionalism in education.

(1 2 3 4 5) 49. Providing leadership and assistance to school divisions in developing a strong medical department, including school nurses.

(1 2 3 4 5) 50. Developing greater respect for traditional American loyalties.

(1 2 3 4 5) 51. Attracting more men into elementary education.

The basically negative reaction to this phony statement is evident in the following excerpt from the third round instrument:

High Low (◯) Your Response [□] Consensus

(1 2 3 [4] 5) 37. Preparing plans which schools could use for goal definition.
Reason:

([1] 2 3 4 5) 38. Explore the possibility of twelve-month school term.
Reason:

(1 2 3 [4] 5) 39. Increasing the qualitative status of the teacher in contemporary society.
Reason:

([1] 2 3 4 5) 40. Eliminating competition among institutions of higher learning in Virginia.
Reason:

(1 2 3 [4] 5) 41. Preparing interdisciplinary courses for high school adoption.
Reason:

(1 2 [3] 4 5) 42. Providing the kind of education needed to solve the problems of contemporary society, such as urban and communication problems.
Reason:

(1 2 3 [4] 5) 43. Developing programs that will increase the capabilities of graduates of the School of Education to produce and utilize research.
Reason:

(1 2 3 [4] 5) 44. Emphasizing the production of doctoral graduates who can improve the programs in Schools of Medicine, Law, Nursing, and Engineering.
Reason:

(1 2 [3] 4 5) 45. Developing criteria, procedures, and tests for measuring without bias such factors as pre-school skills, teacher effectiveness, educational programs, and intellectual aptitude.
Reason:

(1 2 3 [4] 5) 46. Increasing intellectual self-respect of the graduates of the School of Education.
Reason:

(1 2 [3] 4 5) 47. Preparing teachers and administrators to utilize effectively modern technology such as educational television and computer assisted instruction.
Reason:

(1 2 [3] 4 5) 48. Increasing professionalism in education.
Reason:

High

([1] 2 3 4 5) 49. Providing leadership and assistance to school divisions in developing a strong medical department, including school nurses.
Reason:

(1 2 3 [4] 5) 50. Developing greater respect for traditional American loyalties.
Reason:

(1 [2] 3 4 5) 51. Attracting more men into elementary education.
Reason:

(1 2 3 [4] 5) 52. Developing quality courses for adoption and adaptation by elementary and secondary schools such as interdisciplinary courses.
Reason:

(1 2 3 [4] 5) 53. Developing a model undergraduate program.
Reason:

(1 2 [3] 4 5) 54. Developing experimental programs designed to meet the educational needs of minority groups.
Reason:

(1 2 3 [4] 5) 55. Solving problems related to the increasing role of Federal government in education.
Reason:

Another instance of the use of Delphi in state-wide planning is reported by James Jacobson of Utah State University who reported the use of a Delphi exercise involving one state committee of an Eight-State Project on "Designing Education for the Future." His discussion[16] of the problems encountered is as candid a disclosure of some of the realities as I have seen. This 1970 session of the American Educational Research Association was the forum where Dean Cyphert's and Dr. Gant's work was first discussed and was the occasion for still another example of a Delphi exercise applied to educational planning. This was the report by Donald Anderson of Ohio State University who discussed the use of a Delphi exercise undertaken with university help with an intermediate school district in Ohio.[17] An example of a page from the second round questionnaire is reproduced following:

Event	Est. Date		Value to You	
Consolidation will reduce the number of school districts to approximately 100.				
Compulsory school attendance will be relaxed in most suburban schools, and students will attend "the" school only when classroom or laboratory activities are needed by the student.				
One consequence of increased individualization is that students will enter public school at ages ranging from 3 to 7 and leave at ages ranging from 15 to 20 depending on readiness to pursue their chosen goals.				
Formal policy making and daily administrative decisions will be directly influenced by involved staff, students, teachers, parents, and community representatives in 90 per cent of urban and suburban schools.				
Drugs will be used to stimulate and increase learning.				

These illustrations make clear the diversity of topic and approach taken in these different Delphi exercises. Hopefully this is useful. In any case, the conclusion that seems warranted is that a wide range of possible goals and objectives, evaluated by quite different publics can be the object of a Delphi exercise. This may be of considerable importance to the future course of higher education, and to education generally.

One of the projects funded under grant from the U.S. Office of Education this year is an effort by the Coordinating Board of Advanced Education and Accreditation in New Hampshire to undertake a Delphi embracing representation from members of the following bodies:

A. Coordinating Board

B. Facilities Commission

C. State Legislative Finance Committee

D. State Legislative Education Committee

E. State Board of Education

F. State Department of Vocational-Technical Education

G. Trustees of all higher educational institutions

H. Key administrators of all higher educational institutions

I. Student leaders from all higher educational institutions

J. Appropriate representatives from business and industry.

The purpose of the undertaking is reported to be

> "to successfully respond to the charge given by the U.S. Office of Education in its BHE-DAF memo dated December 29, 1970 on Determination of Construction Needs: '. . . development by each state of a long-range plan for the determination of construction needs for its institutions of higher education . . . in sufficien detail to be meaningful to the Commission and the Institutions . . . They should be considered dynamic - subject to periodic review and amendment - and should include all elements the Commission considers necessary to develop construction needs . . ."

As far as can be learned, this will represent the first time that the Delphi technique has been undertaken in so direct a fashion to mesh with the state planning activities encouraged by the U.S. Office of Education.

One of the most obvious uses of the Delphi technique in the educational scene would seem to be its use in finding consensus as to values, or evaluations. An example would be the kind of rating scale frequently encountered in rating teachers. There are only two examples of this kind of use of Delphi that the present research has turned up. The earliest recorded use of Delphi as an evaluation aid involves a paper prepared by Arnold Reisman of Case Western Reserve University for delivery at the Management Division of the American Society of Mechanical Engineers at the Winter Annual meeting in New York in 1968.[19] Dr. Reisman's approach is reproduced in part following. He considered five factors: journal articles, books, public service, committee service on university committees and service in professional societies. These were recorded for faculty members as in the table on the following page:[20]

RECORD OF JOURNAL ARTICLES

FACULTY MEMBER	Year at Institution					
	1	2	3	4	5	Cumulative
1	0	0	0	0	0	0
2	0	0	(1,S,LA)	(1,FLC) (1,STA)	(1,F,TA)	(2,P,LC) (1,F,TA)
3	(1,P,LA)	(1,S,TA)	(1,P,TA)	0	0	(1,P,LA) (1,P,TA)
4	(1,P,LA) (1,S,LA)	(1,P,LA) (2,S,LA)	(2,P,LA) (2,S,TA)	(2,PTA) 0	0 (1,S,LA)	(4,P,LA) (1,S,LA) (2,P,TA)
5	(2,PLA) (2,S,LA)	(2,P,LA) (4,SLA)	(3,PL,A)	0	0	(7,P,LA) (1,S,LA)

CODE

S Submitted for publication
F Favorably reviewed (Accepted)
P Published
L Class of Journal (Learned,Scholarly,Professional)
T Class of Journal ("Trade" magazine)

GRADES OF JOURNALS

A International repute
B National repute
C Regional audience
D Unestablished reputation

Books are coded same as journal articles, except T stands for Text, L for Learned, (Scholarly). Grades (A, B, C, D) refer to publishing house of press.

Then Reisman suggested that one way to reach a consensus on the weight each type of entry should have, would be to employ a Delphi technique. One such point value outcome (Point System 1) is given below:[21]

POINT SYSTEM

I. PUBLICATIONS

A. JOURNAL ARTICLES

LA	10*
LB	8
LC	6
LD	4
TA	7
TB	5
TC	3
TD	1
P	X4
F	X3
S	X1

B. BOOKS

LA	100
LB	80
LC	60
LD	40
TA	90
TB	70
TC	50
TD	40
P	X5
F	X4
S	X2

*Point System 1

II. PUBLIC SERVICE

L	4*
R	6
N	8
I	10
A	X4
B	X3
C	X2
D	X1

III. COMMITTEE PARTICIPATION

A. UNIVERSITY COMMITTEES

D	6
S	8
U	10
G	6
C	X2

B PROFESSIONAL SOCIETY

L 10
T 5

I X4
N X3
R X1

His summary of the ratings achieved is:[22]

POINT RATING*

CRITERION	Faculty Member					
	1	2	3	4	5	
Record of Publications						
Journal Articles	0	69	68	198	290	
Books	710	0	0	0	400	
Committee Part.						
University	122	80	26	52	318	
Professional Society	180	0	70	30	540	
Public Service	80	28	96	240	0	X2**
	1,092	177	260	520	1,548	
	1,172	205	356	760	1,548	

* Not weighted for "age" of accomplishment
** Note multiplying Effect of Public Service X2 does not change the total ranking.

The other approach to using Delphi as a method of obtaining consensus about the value of characteristics of teachers in a college is found in the work of Samuel W. Cochran and his associates[23] at East Texas State University.

Dr. Cochran is a co-author with Norman Dalkey and others of the Rand staff of several reports that Rand has published. His approach to using the Delphi technique in the rating problem was to take the list of teacher characteristics used at East Texas State and ask that each of four panels evaluate them. The list of teacher characteristics read as follows:[24]

TEACHER CHARACTERISTICS SUBMITTED TO RESPONDENTS FOR EVALUATION

1. Teacher should have a thorough knowledge of the course material.
2. Teacher's use of the textbook should be appropriate for the course.
3. Teacher should relate the subject matter of course to course objectives.
4. Teacher should select a textbook that is appropriate for the course.

5. Teacher should possess pleasing voice qualities.
6. Teacher should show interest in the subject matter.
7. Teacher should insure that objectives of the course are easily understandable.
8. Teacher should possess a good attitude toward all students.

9. Teacher should make himself available to students to discuss academic or personal problems.
10. Teacher should organize the content of the course logically.
11. Teacher's use of reference materials should be appropriate for the course.
12. Teacher's assignments should be appropriate to course objectives.

13. Teacher should speak in an intelligible and understandable manner.
14. Teacher should make the course material interesting.
15. Teacher should dress in an appropriate manner.
16. Teacher should exhibit satisfactory mannerisms before the class.

17. Teacher's evaluative techniques should be appropriate to the course objectives.
18. Teacher should relate the material in the course to other fields.
19. Teacher should be fair in grading students.

His major findings are represented by the two tables below.[25]

TABLE A

Correlations between Rank Order of Teacher Characteristics of Rounds 1 and 2 Based on Importance Ratings

	Groups			
	1	2		4
Correlations between value judgments on Rounds 1 and 2	.98	.98	.98	.99

NOTE: In Round 2, each respondent was provided with his responses to Round 1 and a statistical summary of the importance ratings of the other members of his group. He was given an opportunity to revise his importance ratings to each of the 19 characteristics. The probability of the above correlations occurring by chance is less than one time in one hundred.

TABLE B

Correlations between Ranks Obtained by Assigning Relative and Absolute Values to Teacher Characteristics

	Groups 1 & 2 (Faculty)	Groups 3 & 4 (Students)
Correlations	.85	.88

NOTE: Respondents in Groups 1 and 3 assigned relative values (dividing 1,000 points) and subjects in Groups 2 and 4 assigned absolute values (1-7 scale) to each of the 19 teacher characteristics. The characteristics were placed in rank order a cording to their assigned importance in successful college teaching and rank order correlations were computed between the rankings based on Round 2. The probability of the above correlations occurring by chance is less than one time in one hundred.

It was Dr. Cochran's conclusion that the Delphi technique performed very well at determining consensus on these kinds of value ratings. There is a significant place for this kind of use of the Delphi technique. Throughout academic life there are issues that call for the explication of values and the expression of evaluation by faculty groups. It seems likely that the Delphi technique should have a wide use.

It is also possible to use Delphi as a learning device, or as a device to develop capacity for 'futures' thinking. As with any new field there have been some developments whose authors have chosen to give them new, although related names. Thus, we find "Focus Delphi,"[26] and "One Event Delphi,"[27] and Delphi games.[28] Each of these developments has had for its focus a special need perceived as requiring an adaptation of the original Delphi approach. It is this writer's conclusion that the Delphi rubric is already sufficiently expanded as a technique in form and purpose that individualization of adaptations by giving them special names add little to our sum total of problem-solving capability.

Important to the purpose of this paper must be consideration of the criticism that has been raised about the Delphi approach. This principally involves the work of Weaver, Waldron and Welty. Each of these three have made challenges of varying significances to the use of Delphi in higher education. The least substantial of these would appear to be Dr. Welty's concern[29] with the potential consequences of the insertion of bogus items as in the Cyphert-Gant study reported earlier. It seems obvious that any research or problem-solving undertaking can not be made proof against scoundrels. All that the insertion of item 44 in the University of

Virginia Delphi exercise represents is a healthy further reminder to all that by intention, as well as by misadventure, spurious elements can get into any research endeavor. The character of the sponsors, the principal investigator and the ever present possibility of replication are the only safeguards that can exist. Dr. Welty seems overly concerned with the selection of experts as his second critical view. The use of the expert as part of the Delphi exercise response group is at the discretion of each principal investigator and will, necessarily, be defined by him. At least in matters pertaining to education, let alone higher education, it would be hard not to find 'experts' on every hand.

James S. Waldron's work and that of W. Timothy Weaver is related, since each devoted their doctoral dissertations to a consideration of forecasting future events. Waldron's dissertation specifically concerned itself with the Delphi process while Weaver considered other approaches as well as the Delphi approach. The concern expressed by Waldron[30] in terms of the problem of low integratively complex persons versus high integratively complex persons does not seem to this writer to have been linked up to actual Delphi operations. The probable characteristics that can be expected to be encountered in prospective Delphi participants has not been shown to be LIC or HIC as a general rule. Waldron's view on the problem of differential time delay[31] appears more germane to the use of Delphi in higher education. There would seem to be a solution in the provocative work of Dr. Murray Turoff and his experimentation with the Delphi Conference, a teletype terminal computer-linked "conference call" capability to Delphi.[32] This is

particularly true in many higher education situations where computer terminals are readily available.

W. T. Weaver presents a more philosophic view of future cognition. A sampling of his thought is reflected in the following excerpt:[33]

> The intention was to assure that through questionnaires, changes in estimates would reflect rational judgment, and, therefore, not be subject to social psychological factors. Empirical evidence tends to show the naivete' of such an assumption. Three independently conducted studies suggest that within the Delphi procedure individuals who 'swing' in from wide ranges to more narrow ranges do so less on the basis of rational argument, examination of evidence, or review of assumptions than because decision-making strategies of certain persons are subject to change as the task is perceived to be less ambiguous, and on account of certain personality factors such as fundamental needs and integrative complexity.

However, despite Dr. Weaver's reservations about the use of Delphi, he concludes his article in the Phi Delta Kappan with the following:[34]

> . . . although Delphi was originally intended as a forecasting tool,its more promising educational application seems to be in the following areas: (a) a method for studying the process of thinking about the future, (b) a pedagogical tool or teaching tool which forces people to think about the future in a more complex way than they ordinarily would, and (c) a planning tool which may aid in probing priorities held by members and constituencies of an organization.

It may be asked, what are the costs of Delphi, in time and money? It is difficult to make a direct comparison on either count, because you have to inquire, what are the costs, compared to what? Any intensive method of consensus formation will presumably cost more than a more casual undertaking, if only because the apparatus for the assembling of opinion

has to have some cost that is greater than the more casual committee meeting or other method for determining what may constitute a meeting of minds. The time dimension may also be greater for Delphi than its more casual alternatives. Since in at least some face-to-face committee situations there will be a dominant person who railroads the decision through, this can not help but be more expeditious than any other method that seeks iterations of opinion two, three and four or more times. Thus, it seems clear that the adoption of Delphi as a method to reach a consensus on any aspect of educational problem-solving can not depend on its being less costly in dollars nor in time. Nevertheless, an examination of the data presented it seems a tenable conclusion that higher education can benefit from employing Delphi as a method for planning. Given the extent of education's need for more and better planning, this is as high a priority mission as any technique could wish for. The present concern for methods of seeking out consensus, the techniques for discovering futures, is a healthy development that bodes well for higher education and for problem-solving in general. Nor is the Delphi the only product of this quest. We may yet find that methods that have been named as variously as Jan, Judge, Prof, Decision Display Panels, Mapping, future histories, scenarios and cross-impact matrices[35] will be helpful in solving cost/benefit or curriculum planning or college objectives or teacher rating problems in the coming decade.

FOOTNOTES

[1] ____, Selected Rand Publications - Delphi, Santa Monica, The Rand Corporation, 1971, 10 pp.

[2] Marvin Adelson, ed., "Planning Education for the Future," American Behavioral Scientist, Vol. 10, No. 7, (March, 1967), pp. 1-31.

[3] c.f. E.F. Parker, "British Chemical Industry in the 1980's - A Delphi Method Profile," Chemistry and Industry, January, 1970; Eric Jantsch, Technological Forecasting in Perspective, Paris, OECC, 1967; S. Vladimirov, Information on the Future abstracted in Soviet Cybernetic Review, Vol. 3, No. 9 (September, 1969), pp. 109-10. A bibliography of over 100 items on Delphi prepared by John R. Snyder, teaching assistant in the Department of Operations Analysis, University of Toledo is available on request while supplies last.

[4] Norman Dalkey, "The Delphi Method," a paper delivered at the 131st Annual meeting of The American Statistical Association, Fort Collins, Colorado, August 23, 1971.

[5] There are a number of sources. Compare this entry taken from Dalkey's paper, Ibid., with Norman C. Dalkey, The Delphi Method: An Experimental Study of Group Opinion, Santa Monica, The Rand Corporation, 1969, p. 16.

[6] Olaf Helmer, The Use of the Delphi Technique in Problems of Educational Innovations, Santa Monica, The Rand Corporation, 1966, 22 pp.

[7] Robert C. Judd, "Adapting Cost Benefit Analysis to Small College Management Decisions," paper delivered at a National Seminar on Fiscal Management for Developing Colleges, Manchester, N. H., August 21, 1969, pp. 10-15.

[8] Arnold Reisman, et. al., Evaluation and Budgeting Model for a System of Social Agencies, Technical Memorandum No. 167, Cleveland, Department of Operations Research, Case Western Reserve University, 1969.

[9] E.S. Quade, Cost-Effectiveness: Some Trends in Analysis, Santa Monica, The Rand Corporation, 1970, 26 pp.

[10] Ibid., pp. 13-4.

[11] Frederick deW. Bolman, "Constructive Change in Higher Education," Society for College and University Planning Journal, Vol. 2, No. 1 (April, 1971) p. 2.

[12]Robert C. Judd, "Delphi Method: Computerized 'Oracle' Accelerates Consensus Formation," College & University Business, Vol. 49, No. 3, (September, 1970) pp. 30-34.

[13]Bolman, Ibid.

[14]Frederick R. Cyphert & Walter L. Gant, "The Delphi Technique: A Tool for Collecting Opinions in Teacher Education," Journal of Teacher Education, Vol. XXI, No. 3, (Fall, 1970), pp. 419-20.

[15]Abstracted from original questionnaire as used by the University of Virginia, School of Education.

[16]James A. Jacobson, "Forecasting Future Developments in Education," a paper delivered at the American Educational Research Association meeting March 4, 1970 in Minneapolis.

[17]Donald P. Anderson, "Ohio State Study: Clarifying and Setting Priorities on an Intermediate School District's Objectives Utilizing the Delphi Technique," a paper delivered at the American Educational Research Association meeting March 4, 1970 in Minneapolis.

[18]____, Proposal Abstract, New Hampshire, Decision Research, Inc., 1972, 10 pp.

[19]Arnold Reisman and Martin I. Taft, On a Computer-Aided Systems Approach to Personnel Administration, Technical Memorandum No. 147, Cleveland, Department of Operations Research, Case Western Reserve University, 1968, 16 pp.

[20]Ibid., p. 5.

[21]Ibid., p. 10.

[22]Ibid., p. 11.

[23]S. W. Cochran, M. M. Crumley and B. N. Overby, A Study of Values Employing Delphi Techniques, Commerce, Texas, East Texas State University, 1970, 24 pp.

[24]Ibid., p. 4.

[25]Ibid., p. 9-10.

[26]DeLayne R. Hudspeth, A Long-Range Planning Tool for Education: The Focus Delphi, Syracuse, Syracuse University Research Institute, 1970, 65 pp.

[27]Stuart A. Sandow, "Emerging Educational Policy Issues in Law," Futures, forthcomong.

[28]Such as the original parlor game, Future, developed by Helmer and Gordon, or as in computer format, Delphi Exploration, the work of Charles E. Osgood at the University of Illinois or the Ghetto 1984 game created by Jose Villegas at Cornell University.

[29]Gordon Welty, "A Critique of Some Long-Range Forecasting Developments," Proceedings of the 38th Session of the International Statistical Institute, Washington, D.C., August 10-20, 1971, pp. 404-9.

[30]James S. Waldron, "The Delphi Process: Some Assumptions and Some Realities," a paper delivered at the American Educational Research Association meeting February 7, 1971, in New York, pp. 8-10.

[31]Ibid., p. 11.

[32]See for example, Murray Turoff, "The Delphi Conference," The Futurist, April, 1971, pp. 55-7; also see Murray Turoff, Delphi Conferencing, Technical Memorandum TM-125, Washington, D.C., Executive Office of the President, Office of Emergency Prepardness, 1971, 108 pp.

[33]W. Timothy Weaver, "The Delphi Forecasting Method," Phi Delta Kappan, January, 1971, p. 270.

[34]Ibid., p. 271.

[35]In the order mentioned these refer to: James C. Naylor & Robert J. Wherry Sr., "The Use of Simulated Stimuli and the 'Jan' Technique to Capture and Cluster the Policies of Raters," Educational & Psychological Measurement, XXV, No. 4 (1965) pp. 969-86; L. W. Miller, R. J. Kaplan & W. Edwards, "Judge: A Value-Judgment-Based Tactical Command System," Organizational Behavior and Human Performance Vol. 2 (1967) pp. 329-74; Robert J. Wherry Sr. & James C. Naylor, "Comparison of Two Approaches-Jan and Prof-for Capturing Rater Strategies," Educational & Psychological Measurement, XXVI, No. 2 (1966) pp. 267-86; Howard A. Wells, "Query Techniques, Panels of Experts, and Sociometric Considerations," a paper presented at the 32nd meeting of the Operations Research Society of America, Chicago, 1967; Donald L. Pyke, "Mapping-A System Concept for Displaying Alternatives" a paper delivered at the Technological Forecasting Concepts & Methods Advanced Seminar, New York, 1970; Stuart A. Sandow, "The Pedagogy of Planning: Defining Sufficient Futures," forthcoming in Futures, The Journal of Forecasting and Planning discusses future histories, scenarios and cross-impact matrices in conjunction with Delphi.